

This is especially noticeable as regards the bibliography. Many of the essayists hit a happy mean, but H. Przibram actually gives 31 pages of references in his 77-page article on regeneration, whilst v. Monakow gives 846 distinct references, occupying 27 pages. Prof. Biedermann sins in the opposite direction, and in his otherwise comprehensive and instructive article on electrophysiology, sometimes mentions authors without giving any clue to their papers. Again, several of the articles are well illustrated (especially v. Monakow's important article on cortical localisation, which has eight plates), and it would be well if this most useful feature could be extended to certain other of the articles, though doubtless the question of expense comes in here.

In the limits of a short notice like the present one, it is impossible even to mention the titles of all the essays, but reference may be permitted to a few, over and above those already cited. P. Jensen gives a useful description of protoplasmic movement, and the effects of external conditions upon it, whilst J. von Uexküll writes a philosophical essay on the psychology of the lower animals. O. Langendorff enters very thoroughly into the properties of cardiac muscle, and discusses the nature of heart contraction, whether nervous or myogenic. L. Asher treats of certain aspects of the vaso-motor system, and R. du Bois-Reymond deals fully with the mechanics of respiration. H. E. Hering writes at some length on the central nervous paralysis of skeletal muscles (*e.g.* reflex inhibition, antagonistic muscles, decerebrate rigidity), whilst P. Grützner treats of the voice and speech, and H. Zwaardemaker of smell.

Finally, a word of praise must be accorded to the admirable manner in which the volume is printed. The large and well interspaced type renders reading a pleasure. Also printer's errors are remarkably infrequent.

H. M. VERNON.

PHYSICAL CHEMISTRY AND BIOLOGY.

Physikalische Chemie der Zelle und der Gewebe. Von Dr. Rudolf Höber, Privatdocent der Physiologie an der Universität Zürich. Pp. xii + 344. (Leipzig: W. Engelmann.) Price 9s. net.

THE keynote to this interesting volume is found in the beautiful quotation from von Humboldt with which the author introduces his preface.

"Es ist die Sitte derer, die gerne andere auf den Gipfel der Berge führen möchten, dass sie den Mitreisenden den Weg gebahnter und anmutiger schildern, als man ihn finden wird, und dass sie die Aussicht von den Bergen rühmen, auch wenn sie ahnen, dass ganze Teile der Gegend in Nebel verhüllt bleiben werden. Sie wissen, dass auch in dieser Verhüllung ein geheimnisvoller Zauber liegt, dass eine duftige Ferne den Eindruck des Sinnlich-Unendlichen hervorruft, ein Bild, dass im Geist und in den Gefühlen sich ernst und ahnungsvoll spiegelt."

The author proves himself in the subsequent pages of the volume just such an inspiring guide as this, and points out the varied prospects from many points of view in his different chapters.

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The book is interestingly written throughout, and although space makes it impossible to mention all recent work in the applications of the new advancements of physical chemistry to biology, the work is thoroughly up to date in most important directions of this extensive field of research.

The author states in his preface that the book is intended as a first review of the subject for those who may subsequently study in larger text-books, and be stimulated thereby to aid in its development; but, in the opinion of the reviewer, the book will be found most interesting to those who already possess a considerable acquaintance with physical chemistry, and desire a comprehensive and suggestive review of its relationship to biology and physiology.

Parts of the subject, such, for example, as the development of the ionic theory, and equilibrium in solution, are from the size of the book presented in such concise form as to make anything but easy reading for a beginner at the subject; while others, such as the permeability of the cell membrane, the physical theory of the action of anæsthetics, absorption, secretion and lymph formation, form attractive reading, and demand little special previous knowledge of the subject.

The physical chemist owes to the biologist the earliest experimental work upon osmotic pressure and its relationship to molecular weight. It was the study of osmosis and osmotic pressure by Pfeffer and Traube on account of its relationship to cell life which chiefly led to the conception that substances in solution behave in certain respects like gases, and this formed the starting point for the physical chemistry of solutions.

For this early service biologists are now being repaid by the great opportunities which increased knowledge of physical chemistry is giving in the prosecution of the study of the chemical and physical processes taking place in the cell.

In this development of biology based on physical chemistry, the work is not being done solely by physical chemists, on the one hand, or by biologists on the other, but important contributions have been and are being made to the common store by both biologists and physical chemists. A perusal of the book before us demonstrates most clearly this mutual relationship between physical chemistry and biology, for in the names of authors one finds those both of important biologists and physical chemists.

It is along this line of physical chemistry, so far as one can foresee, that the most important and rapid growth in biology will take place in the near future, and hence it is most important for either following or taking a share in these developments that every biologist should also be acquainted with recent progress in physical chemistry. Certain portions of the book may specially be recommended to those who desire in a short space to learn something of the close practical relationship of physical chemistry to biology and also to medicine, such as that on the solubility of uric acid, urates, and the purin bodies, and on the action of indicators, pp. 88 to 101; the permeability of the cell-membrane, especially that portion dealing with the action of anæsthetics, pp. 101 to 134; action of ions upon cells, pp. 134 to 146, and 171 to 184; methods of

physico-chemical analysis, pp. 206 to 251; and lastly, the most interesting account given on pp. 272 to 315 of the physical chemistry of ferment action, and of Bredig's recent discovery of inorganic ferments.

The whole volume well deserves careful reading, and it is to be hoped that it will find a wide circle of readers amongst workers in all divisions of the very comprehensive subject of biology.

BENJAMIN MOORE.

OUR BOOK SHELF.

Contribution à l'Étude du Mode de Production de l'Électricité dans les Êtres vivants. Par M. le Dr. Louis Querton. Pp. 180. (Bruxelles: Lamartin, 1902.)

THIS contribution to the existing literature upon the subject of vital electromotive phenomena contains some new researches which support the view advocated by the author that the electrical changes in living tissues are caused by definite chemical processes. The view is not a new one, and its advocacy in the present publication appears to have been called forth by the attitude taken by Mendelsohn in his article upon the subject in the "Dictionnaire de Physiologie," edited by Prof. Richet; this attitude is described by Dr. Querton in the following quotation from M. Mendelsohn's article:—

"The conception of the chemical origin of the electrical phenomena observed in nerve and muscle is purely hypothetical."

Dr. Querton has done useful service in bringing together additional evidence that the electrical phenomena are in many cases the indications of definite chemical processes. The author gives a brief review of the general features of the phenomena in electrical organs, muscles, nerves, the eye, glandular tissue, the skin and the leaves of plants; he then describes observations of his own as to the direct connection between such electrical phenomena in plant leaves as are produced by the action of light and (photo-)chemical changes in the chlorophyll; he follows these by a description of photo-electric phenomena occurring in solutions of oxalic acid, &c.

As regards the general review, this is admittedly scanty, particularly in the part which deals with the electric organs of fishes, and in dealing with this portion of the subject the author does not appear to have recognised that recent observations point to the conclusion that the electrical organs of fishes are to be classed among nervous, and not among muscular, structures. The author's own researches show that electromotive effects may be rapidly developed, and may rapidly subside in correspondence with the similar development and subsidence of chemical changes of comparatively small amount, and this result appears to support the view of chemical causation which he advocates. It must, however, be admitted that in nervous tissues, chemical change is so slight or so masked as to give no indications of its occurrence unless, indeed, the electrical alterations are assumed to be such indications, an assumption which, for the purpose of the argument, is logically unsound. Even in the case of the pronounced electromotive effects observed in the electrical organs of fishes there is the same lack of evidence, and it would therefore seem that provided the chemical change is of a certain type, a relatively insignificant chemical alteration may be associated with very definite electromotive effect; in this connection the possibility of the occurrence of surface tension changes as the result of chemical alter-

ation might have been treated by the author with great advantage.

The impression left on reading the author's conclusions is that, although these indicate that one antecedent of the electromotive phenomena observed in living tissues is chemical change, the more interesting question as to whether this chemical antecedent is a remote or an immediate factor in their causation remains untouched.

Statics by Algebraic and Graphic Methods. By Lewis J. Johnson, C.E. Pp. viii+134; with six plates. (New York: Wiley and Sons; London: Chapman and Hall, Ltd., 1903.) Price 2 dollars.

FROM the preface we infer that the author has set out with the object of providing engineering students with a text-book of small compass in which the elementary parts of statics are treated on a deductive basis, and analytical and graphical methods of solution are treated side by side.

It cannot be said that the book fulfils either of these objects as adequately as it should. The proofs of the conditions of equilibrium and of the parallelogram of forces are so unsound that it would be far better to replace them by a few definite axiomatic statements. As an example, take the statement in the footnote on p. 14 (in connection with the moment of a force about a point), "For assuming the point to be fixed is really assuming it to be always subject to a force equal, opposite and parallel to the given one."

In regard to the graphic solution of problems, it is possible that when a student has been told how to draw a force diagram, he may apply the method to an example, and actually measure the lines representing the forces, the only drawback being that in the questions the angles of the figures are not specified, and the figures are too small to give good scale diagrams without this help. The so-called algebraic solutions are too suggestive of the well-known type of examination answer, "By taking moments the resultant can be found." This usually means that the candidate cannot find it. The best feature of the book is the set of six typical problems which are actually solved by both methods on the plates at the end.

De l'Expérience en Géométrie. Par C. de Freycinet. Pp. 178. (Paris: Gauthier Villars, 1903.) Price 4 francs.

THE author discusses the question whether geometry is purely a rational science or whether it also possesses an experimental side. The question is dealt with in connection with (1) the concepts of geometry, (2) geometrical axioms, and (3) the propositions the establishment of which forms the object of deductive geometry. In the first chapter, M. de Freycinet finds no *a priori* reasons for the existence of such concepts as space, straight line, curved line, plane or curved surface, volume, angle, parallelism, tangency. These and other concepts are all suggested to us by our perception of the material universe. Passing on to the axioms relating to the straight line and plane, the author considers that it can in no sense be regarded as a self-evident truth that the straight line is the shortest line between two points, that a straight line can be produced indefinitely in either direction, or that two straight lines cannot have two points in common. These and other similar facts can only be regarded as results of experience and observation. In comparing the purely geometrical methods of the ancients with the analytical methods of Descartes and Leibnitz, the latter methods will be found in reality to be no less concrete in their foundations than the former. They do not discuss the geometrical truths of which they make use, but they accept them as evident, relying on pure geometry to establish them.